

SPECIFICATION of the Calotype Photographic Process,  
invented by H. F. TALBOT, Esq., as enrolled  
in the year 1841.

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THE first part of my Invention is a method of making paper extremely sensitive to the rays of light. For this purpose I select the best writing-paper, having a smooth surface, and a close and even texture.

*First Part of the Preparation of the Paper.*

I dissolve one hundred grains of crystallized nitrate of silver in six ounces of distilled water. I wash one side of the paper with this solution with a soft camel-hair brush, and place a mark upon that side by which to know it again. I dry the paper cautiously at a distant fire, or else I leave it to dry spontaneously in a dark place. Next I dip the paper in a solution of iodide of potassium, containing five hundred grains of that salt dissolved in one pint of water. I leave the paper a minute or two in this solution. I then take it out and dip it in water. I then dry it lightly with blotting-paper, and finish drying it at a fire, or else I leave it to dry spontaneously. All this process is best done in the evening by candlelight. The paper thus far prepared may be called for the sake of distinction

iodized paper. This iodized paper is scarcely sensitive to light, but nevertheless it should be kept in a portfolio or some dark place till wanted for use. It does not spoil by keeping any length of time, provided it is kept in a portfolio, and not exposed to the light.

*Second Part of the Preparation of the Paper.*

This second part is best deferred until the paper is wanted for use. When that time is arrived, I take a sheet of the iodized paper and wash it with a liquid prepared in the following manner: dissolve one hundred grains of crystallized nitrate of silver in two ounces of distilled water, to this solution add one-sixth of its volume of strong acetic acid: let this mixture be called A. Dissolve crystallized gallic acid in distilled water as much as it will dissolve (which is a very small quantity): let this solution be called B. When you wish to prepare a sheet of paper for use, mix together the liquids A. and B. in equal volumes; this mixture I shall call by the name of gallo-nitrate of silver. Let no more be mixed than is intended to be used at one time, because the mixture will not keep good for a long period. Then take a sheet of iodized paper and wash it over with this gallo-nitrate of silver with a soft camel-hair brush, taking care to wash it on the side which has been previously marked. This operation should be performed by candlelight. Let the paper rest half a minute, and then dip it into water, then

dry it lightly with blotting-paper; and lastly, dry it cautiously at a fire, holding it at a considerable distance therefrom. When dry, the paper is fit for use, but it is advisable to use it within a few hours after its preparation. (*Note.*—That if it be used immediately the last drying may be dispensed with, and the paper may be used moist.) (*Note the second.*—Instead of using a solution of gallic acid for the liquid B., the tincture of galls diluted with water may be used, but it is not so advisable.)

#### *Use of the Paper.*

The paper thus prepared, and which I name “calotype paper,” is placed in a camera obscura, so as to receive the image formed in the focus of the lens: of course the paper must be screened or defended from the light during the time it is being put into the camera. When the camera is properly pointed at the object this screen is withdrawn, or a pair of internal folding doors are opened, so as to expose the paper for the reception of the image. If the object is very bright, or the time employed is sufficiently long, a sensible image is perceived upon the paper when it is withdrawn from the camera, but when the time is short or the objects dim, no image whatever is visible upon the paper, which appears entirely blank; nevertheless it is impressed with an invisible image, and I have discovered the means of causing this image to become visible. This is performed as follows: I take some

gallo-nitrate of silver prepared in the manner before directed, and with this liquid I wash the paper all over with a soft camel-hair brush, I then hold it before a gentle fire, and in a short time (varying from a few seconds to a minute or two), the image begins to appear upon the paper. Those parts of the paper upon which the light has acted the most strongly become brown or black, while those parts on which the light has not acted remain white. The image continues to strengthen, and grow more and more visible during some time. When it appears strong enough the operation should be terminated, and the picture fixed.

#### *The Fixing Process.*

In order to fix the picture thus obtained, I first dip it into water, I then partly dry it with blotting-paper, and then wash it with a solution of bromide of potassium, containing one hundred grains of that salt dissolved in eight or ten ounces of water; the picture is then washed with water, and then finally dried. Instead of bromide of potassium a strong solution of common salt may be used, but it is less advisable. The picture thus obtained will have its lights and shades reversed with respect to the natural objects, videlicet, the lights of the objects are represented by shades, and vice versa. But it is easy from this picture to obtain another, which shall be conformable to nature, videlicet, in which the lights shall be represented by lights, and

the shades by shades. It is only necessary for this purpose to take a second sheet of sensitive calotype paper, and place it in close contact with the first upon which the picture has been formed, a board is put beneath them, and a sheet of glass above, and the whole is pressed into close contact by screws; being then placed in sunshine or daylight for a short time, an image or copy is formed upon the second sheet of paper: this image or copy is often invisible at first, but the image may be made to appear in the same way that has been already stated. But I do not recommend that the copy should be taken on calotype paper,—on the contrary, I would advise that it should be taken on common photographic paper. This paper is made by washing good writing-paper, first with a weak solution of common salt, and next with a solution of nitrate of silver. Since it is well known, having been freely communicated to the public by myself in the year one thousand eight hundred and thirty-nine, and that it forms no part of the present invention, I need not describe it here more particularly. Although it takes a much longer time to obtain a copy upon this paper than upon calotype paper, yet the tints of the copy are generally more harmonious and agreeable. On whatever paper the copy is taken it should be fixed in the way already described. After a calotype picture has furnished a good many copies it sometimes grows faint, and the subsequent copies are inferior. This may be prevented by means of a process which revives the strength of the calotype pictures. In order to do this, it is only necessary

to wash them by candlelight with gallo-nitrate of silver, and then warm them. This causes all the shades of the picture to darken considerably, while the white parts are unaffected. After this the picture is of course to be fixed a second time. The picture will then yield a second series of copies, and a great number of them may frequently be made. (*Note.*—In the same way in which I have just explained, that a faded calotype picture may be revived and restored, it is possible to strengthen and revive photographs which have been made on other descriptions of sensitive photographic paper, but these are inferior in beauty, and moreover the result is less to be depended upon; I therefore do not recommend them.)

*The next part of my invention* consists of a mode of obtaining positive photographic pictures, that is to say, photographs in which the lights of the object are represented by lights, and the shades by shades. I have already described how this may be done by a double process; but I shall now describe the means of doing it by a single process. I take a sheet of sensitive calotype paper and expose it to daylight, until I perceive a slight but visible discoloration or browning of its surface; this generally occurs in a few seconds. I then dip the paper into a solution of iodide of potassium of the same strength as before, *videlicet*, five hundred grains to one pint of water. This immersion apparently removes the visible impression caused by the light, nevertheless it does not really remove it, for if the paper were to be now washed with gallo-nitrate

of silver it would speedily blacken all over. The paper when taken out of the iodide of potassium is dipped in water, and then slightly dried with blotting-paper ; it is then placed in the focus of a camera obscura, which is pointed at an object ; after five or ten minutes the paper is withdrawn and washed with gallo-nitrate of silver, and warmed as before directed : an image will then appear of a positive kind, namely, representing the lights of the object by lights, and the shades by shades. Engravings may be very well copied in the same way, and positive copies of them obtained at once (reversed, however, from right to left). For this purpose a sheet of calotype paper is taken and held in daylight to darken it as before mentioned ; but for the present purpose it should be more darkened than if it were intended to be used in the camera obscura. The rest of the process is the same. The engravings and the sensitive paper should be pressed into close contact, with screws or otherwise, and placed in the sunshine, which generally effects the copy in a minute or two. This copy if it is not sufficiently distinct must be rendered visible or strengthened with the gallo-nitrate of silver as before described. I am aware that the use of iodide of potassium for obtaining positive photographs has been recommended by others and I do not claim it here by itself as a new invention, but only when used in conjunction with the gallo-nitrate of silver, or when the pictures obtained are rendered visible or strengthened, subsequently to their first formation. In order to take portraits from the life I prefer to use for the

object-glass of the camera a lens whose focal length is only three or four times greater than the diameter of the aperture. The person whose portrait is to be taken should be so placed that the head may be as steady as possible, and the camera being then pointed at it an image is received on the sensitive calotype paper. I prefer to conduct the process in the open air under a serene sky, but without sunshine, the image is generally obtained in half a minute or a minute. If sunshine is employed, a sheet of blue glass should be used as a screen to defend the eyes from too much glare, because this glass does not materially weaken the power of the chemical rays to affect the paper. The portrait thus obtained on the calotype paper is a negative one, and from this a positive copy may be obtained in the way already described. I claim first the employing gallic acid or tincture of galls, in conjunction with a solution of silver to render paper which has received a previous preparation more sensitive to the action of light. Secondly, the making visible photographic images upon paper, and the strengthening such images when already faintly or imperfectly visible by washing them with liquids which act upon those parts of the paper which have been previously acted upon by light. Thirdly, the obtaining portraits from the life by photographic means upon paper. Fourthly, the employing bromide of potassium or some other soluble bromide for fixing the images obtained.